Appendix A-B

Quality Management Plan

for

Civil Works Engineering and Design

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Changes to this document require the concurrence of the Management Representative and approval by the Chief, ED-D, and shall only be made following the procedures described herein.

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1.0 PURPOSE

This Quality Management Plan (QMP) for Civil Works Engineering and Design defines the responsibilities and procedures for managing the quality of services and products delivered to our customers by the Sacramento District (SPK) Engineering Division (ED) for traditional Civil Works projects and other customers through In-House (I-H) design staff and Architect Engineer (A-E) firms. The activities cited in this QMP are in accord with requirements specified in section 3.0 REFERENCES, and specific QMPs developed for other applicable Branches of Engineering Division and functional Divisions of the District.

2.0 SCOPE

This QMP applies to all products and services developed by Civil Design Branch and will be followed for all efforts, whether prepared by In-House staff, other Corps/Agency offices, or an Architect-Engineer firm. This QMP applies directly to all Civil Design Branch personnel, and, as appropriate, to Geotechnical, Cost Engineering, and Environmental Engineering Branches. This QMP also applies indirectly, as appropriate, to all functional divisions that support Civil Works efforts.

3.0 REFERENCES

Depending upon the type of product, funding source, and design complexity, various combinations of regulations, manuals, and guidance may apply. The primary documents containing guidance and criteria that apply to Civil Design Branch products and services are listed below:

a) General

(1) ER 1110-1-12, Quality Management.

(2) CESPD-R 1110-1-8, Quality Management Plan.

(3) ER 1110-1-8158, Corps-Wide Centers of Expertise.

(4) ER 415-1-11, Biddability, Constructibility, Operability and Environmental Review.

(5) Engineering Quality Procedure 5-01, Procedure for the Preparation and Administration of Procedures.

(6) Sacramento District, Engineering and Design Quality Management Plan, Appendix A

b) Civil Works Design and Construction

(1) ER 1110-2-1150, Engineering and Design for Civil Works Projects.

(2) EM 1110-2-1913, Design and Construction of Levees.

(3) EM 1110-2-2300, Earth and Rock-Fill Dams - General Design and Construction Considerations.

(4) ER 1110-2-112, Required Visits to the Construction Sites by Design Personnel.

4.0 DEFINITIONS

a) Customer - The owner, client, local sponsor, user or beneficiary of a service or product.

b) Quality Control (QC) - Activities taken to ensure quality verification for each element of a product or service. It encompasses such activities as detailed calculation and analysis checks, regulation compliance verification, cross discipline product development team compatibility checks, seamless review (designer/reviewer consultations, Independent Technical Review), etc.

c) Quality Assurance (QA) - Activities taken to ensure the overall effectiveness of the quality control process. Its primary emphasis deals with the prevention of nonconforming product through the evaluation and assurance of adequate quality controls being utilized.

d) Quality Product - The intent of SPK is to deliver quality engineering and design services and products to our customers on schedule and within budget. A quality product conforms to customer expectations in functional, technical, aesthetic, and environmental requirements. A quality product is generally consistent with applicable technical criteria regulations and laws. An acceptable level of quality does not imply perfection; however, no compromise of functional, health or safety requirements will be permitted. As such, the quality to be achieved for each service and product prepared by Civil Design Branch shall be in conformance with properly developed customer requirement expectations.

e) Product - This represents the deliverable, end product required to satisfy the customer requirements, i.e., a Basis of Design, a report, plans and specifications.

f) Product Development Team (PDT) – The technical discipline team members whom by working cooperatively together will produce the product.

g) Product Development Team Leader (PDTL) – The Project Manager (PM) will serve as the leader of the PDT and will utilize the skills of the individual PDT members to produce the product.

5.0 POLICY

Civil Design Branch and the Section Chiefs and all personnel involved in the study, analysis, design, checking and/or review process for development of Civil Works products are responsible for adhering to the requirements of this QMP. Specific attention is required by designers and reviewers to recognize applicable lessons learned and to incorporate them in each effort undertaken.

The Civil Design Branch shall be responsible for the engineering management of I-H and A-E prepared Civil Works products by the establishment of criteria, functional requirements, an execution schedule and related budgets. Geotechnical Branch, Cost Engineering Branch, Environmental Engineering Branch, and Contracting Division (CT) personnel participate in and support this effort. Civil Design Branch is responsible for the production of I-H studies, analysis and designs. Before taking on an I-H effort, Civil Design Branch shall ensure that sufficient resources with appropriate technical capabilities are available to complete the product within the required schedule and cost. Open-end A-E contract resources, Mandatory Centers of Expertise (MCX), and other Corps offices/agencies will be utilized when necessary to execute any specific effort as required. The Civil Design Branch has responsibility for the designer selection process, contract oversight, and performance evaluation when A-E firms are used.

6.0 QUALITY MANAGEMENT

6.1 Project Initiation.

No product development work shall be initiated by Civil Design Branch staff and the total product development team prior to receipt of a Funded Work Item (FWI) appropriately issued by the Project Manager through the CEFMS system. ER 1110-2-1150 establishes engineering responsibilities, requirements, and procedures during all phases of Civil Works projects. Civil Design Branch's role in each defined phase of Civil Works project development shall be as follows:

a) Reconnaissance Phase - Civil Design Branch along with other Engineering Division Branches, as appropriate, will provide quality studies, analyses, designs, cost estimates and other technical services to allow Planning Division (responsible functional District element) to establish whether a Federal interest exists in the Civil Works project being evaluated.

b) Feasibility Phase - Civil Design Branch along with other Engineering Division Branches, as appropriate, will provide quality technical studies, analyses, designs, cost estimates and other technical services to allow Planning Division (responsible functional District element) to formulate a selected plan which meets the customer's (non Federal sponsor's) needs, is acceptable to concerned State and Federal agencies, complies with all appropriate administrative and technical criteria and national objectives, and is developed in sufficient detail to accurately identify project construction costs.

c) Preconstruction Engineering and Design (PED) Phase - Civil Design Branch along with other appropriate Engineering Division Branches, is responsible to conduct the in-depth technical studies, analyses and designs necessary to support the preparation of quality design documents (DDR/EDR) and follow-on plans and specifications (P&S) for the initial project construction contract. These efforts shall satisfy the customer's and governing technical requirements for the authorized project.

d) Construction Phase - Civil Design Branch along with other Engineering Division Branches shall complete the remaining design memoranda and plans and specifications, as appropriate, necessary for subsequent construction activities necessary to complete the project on schedule and within budget with product quality established by contract requirements. Field visits shall be made during construction to ensure construction is proceeding in accordance with design, and modifications of designs made during construction are being incorporated appropriately. Construction-Operations Division is the responsible District element for this Phase.

e) Operations Phase - Engineering Division Branches shall support Construction-Operations Division (responsible functional District element) for requested operations and maintenance support activities including major rehabilitation activities that require technical support, engineering and design and plans and specifications.

6.1.1 Customer Requirements.

Prior to initiating any product development effort, the customer's requirements shall be discussed, and clearly defined and documented. A customer requirements identification/clarification (i.e., PreDesign) conference shall be conducted to insure this goal is achieved. Functional needs, technical requirements, execution schedule and budget shall be addressed with the customer during this conference. The assigned Civil Design Branch PDT members along with the PM shall be responsible for ensuring that customer requirements are fully understood, that clear and accurate design criteria are established, and that the subsequent guidance and direction for the product development team are clearly understood and fully documented. The PDTL shall be the single POC for: the customer on requirement and programmatic issues; Program Management Office (PMO) for financial support; and the product development for technical and execution issues.

6.1.2 Technical Requirements.

This function addresses a technical suitability/appropriateness overview of major system selection or design direction decisions for each discipline and the collective team involved in a design effort. Technical quality design activities shall normally be accomplished throughout each major design phase, allowing sufficient time for any required adjustments prior to submitting design documents to the Independent Technical Review (ITR) for the formal review.

6.1.3 Designer Selection.

Prior to initiating any product development effort, the method of execution (i.e., I-H, A-E, OC or OA) shall be determined. This decision shall be based on a thorough understanding of the product development needs, technical expertise required, customer participation intentions, required execution timeframe, available funds, and other associated considerations (e.g., A-E Contracting requirements). The assigned Civil Works PM with Engineering Division input, orchestrated by Civil Design Branch, shall recommend the Designer Selection which shall be ratified by the Chief, Engineering Division (or his designee) prior to proceeding. The PM shall be responsible and accountable for executing the assigned product development effort (whether by I-H or A-E resources). If the full product design will be completed by an A-E then the PM will manage that A-E contract with assistance from each technical discipline for scoping and review as required by the PM. If the work is to be executed by I-H resources, the PDT members shall be selected by the Chiefs of the technical discipline sections necessary to execute the work. The specific technical discipline efforts and details shall be the responsibility of the respective product development team members. Technical discipline sections shall be responsible to insure that the most appropriate, high quality technical input is provided for each product development effort.

6.1.4 General Design Conference.

The PM shall chair a Design (a.k.a. Scope Clarification) Conference with the customer and the design team. The purpose of this conference shall be to define clearly the customer's expectations, requirements, and scope for the project. A sufficient number of design team personnel shall attend this conference to ensure all significant technical and environmental areas associated with the project are adequately discussed and customer requirements understood. The PM shall ensure the necessary customer and construction representatives attend this conference to discuss adequately and agree on project requirements. This shall include the types of design, deliverables, review process/responsibilities, and project milestones and constraints. The conference shall include a project site visit to allow for physical verification of the site conditions that could affect the design whenever possible. Specific information shall include, but is not limited to, field lessons learned, construction phasing, construction constraints, special testing, and site constraints. The PM shall document the discussions and agreements reached during the conference and distribute a copy of the minutes to all appropriate parties. The project Scope, Project Engineering Budget and Schedule will then be developed before initiation of design services. If the project is to be accomplished by an A-E then a Scope of Work (SOW) will be prepared, however, if the product is to be completed by I-H staff then a Scope of Services (SOS) for each PDT member by discipline will be developed.

6.1.5 Scope of Services (SOS).

As a result of the General Design Conference referenced in paragraph 6.1.4, the PM and PDT (in-house) shall develop a detailed SOS for each discipline for the project that defines the services and deliverables to be provided by the PDT members to meet the customer's expectations/requirements, and governing technical criteria. The product development budget and schedule data shall be based on the requirements specified in each SOS. The final SOS shall reflect the products and services that can be obtained within the mutually approved schedule and budget. The SOS shall be reflected in the PMP development by the PM. If the product development effort will be accomplished by an A-E, then the SOW for the negotiations will be developed.

6.1.6 Schedule.

All project schedules shall be established and maintained in current PROMIS/Microsoft Project database compatible with CEFMS. The schedule shall be based on the requirements specified in the SOS/SOW. The schedule shall be prepared through a cooperative effort between the PM and PDT. Schedules shall be updated when changes occur, and as a minimum reviewed at least monthly to ensure that critical milestones and forecast dates are met. The schedule shall identify key interaction and submission points within the product development process, and reflect the required design phases to be accomplished. Product development and review times shall be separately identified. Sequential calendar completion dates shall be identified for each key point within each development phase; the calendar day duration between key points shall also be identified. The calendar dates for the initial product development phase shall be accurate upon issuance of the FWI. Dates for subsequent phases shall be projected and subject to modification to reflect the actual start date of each phase. The PM shall coordinate the development of the product development schedule within the PDT.

6.1.7 Budget.

The product development budget shall identify by discipline and by phase of design the development budget for the product. The budget shall be developed from a Task Resource Analysis (IRA) conducted by each discipline based on anticipated effort (considering such things as sheet counts and man-hour requirements) necessary to comply with the product SOS/SOW. The PM shall coordinate the development of the budget, to include all technical effort and deliverables. This technical product development budget shall serve as input to the Total Project Budget which shall be developed by the PM. The PM shall be responsible for managing the product development team efforts to be completed within the initially established budget or approved adjusted budget.

6.1.8 Work Requests.

The PM shall provide to the A -E and/or I-H design teams the following design support data as requested, to include a SOS and Funded Work Item (FWI) (SOW for A-E efforts), within a period that will support the established project design schedule:

6.1.8.1 A-E Design Services.

The PM shall ensure that a contract is issued to the A-E for work and services. The contract reflects the agreed upon project design schedule and fee, and references the project SOW for required design services.

6.1.8.2 I-H Design Services.

The PM shall issue a Scope of Services and FWI to each Branch section to initiate I-H design services for a specific project effort. The SOS is the execution contract between the PM and the I-H design team. The SOS and FWI reflects the agreed upon project design schedule and budget, and required design services. At no time shall I-H personnel proceed with work without receipt of the SOS and FWI from the PM.

6.1.8.3 Surveys.

The PM shall issue a Scope of Services and FWI to the Geology and Mapping Section of Geotechnical Branch to acquire and provide the design team with all topographic data necessary to support project design. The scope and requirements of the survey effort shall be coordinated with the design team.

6.1.8.4 Explorations.

The PM shall issue a SOS and FWI to the Geology and Mapping Section of Geotechnical Branch. The Geology Section will acquire and provide the design team with all explorations, lab testing, and boring logs necessary to support project design. The scope and requirements of exploration effort shall be coordinated with the design team.

6.1.8.5 Geotech Report.

The PM shall issue a SOS and FWI to the Soil Design Section of Geotechnical Branch. The Soil Design Section will develop and provide the design team with preliminary and final Geotech Reports that address specific requirements of the site and project.

6.1.8.6 Material Report.

The PM shall issue a SOS and FWI to the Soil Design Section of Geotechnical Branch. The Soil Design Section will develop and provide the design team with preliminary and final Material Reports that address specific project requirements.

6.1.8.7 Environmental.

The PM shall issue a SOS and FWI to Environmental Engineering Branch Sections to develop and provide the design team with Hazardous, Toxic, and Radioactive Waste (HTRW) contaminant survey data as necessary. Environmental Engineering Branch representatives shall be invited to Predesign and follow-on review conferences and assist the PM in requirement definition, as applicable.

6.1.8.8 Construction Quality Assurance.

The PM shall issue a SOS and FWI to the Construction-Operations Division BCOE Review Section. The Construction-Operations Division will provide BCOE review comments to the design team that address specific requirements of the site and project.

6.1.8.9 Design Verification.

The PM shall issue a SOS and FWI to each discipline represented on the ITRT. The ITRT will provide Independent Review comments including BCOE comments to the design team that addresses specific requirements of the site and project.

6.1.8.10 Specifications.

The PM shall issue a SOS and FWI to the ET&S Section of Military Design Branch. The ET&S Section will provide the front-end and Electronic Bid Set to CT.

6.1.8.11 Cost Engineering Branch.

The PM shall issue a SOS and FWI to the Cost Engineering Branch. The Cost Engineering Branch will provide the preliminary and final government estimates as requested by the PM.

6.1.9 Quality Plans

6.1.9.1 Quality Control Plan (QCP).

A QCP shall be prepared for every Civil Works product or service developed by I-H staff. ER 1110-1-12, paragraph 6.a.(1), states the QCP is ". . . a management plan for executing a quality engineering product or service, on schedule and within budget." The QCP for small or simple projects (i.e., Programmed Amount <$500,000) should be a very simple, generic document, setting forth the schedule and a minimum of coordination information. A more comprehensive document shall be prepared for large or complex projects (i.e., Programmed Amount >$500,000). While a design QCP should be complete, it need not duplicate items of a definitional or procedural nature that are in the Civil Works QMP. The QCP shall be incorporated into the Project Management Plan (PMP). It is recognized that each design team has their own quality control procedures and each PM their own management style, however, the product shall meet the customer's expectations for quality, cost and schedule. Proper documentation and QC certification shall be included in the District project files.

1) A-E Contracts. The PM shall include a requirement in the SOW to submit a QCP to the Government. The QCP shall address coordination, checking, and correcting for all disciplines. The QCP shall also address a sub-period of service sufficient to satisfy the QC process and the preparation of documentation by the A-E to verify that the QCP has been implemented. The PM and A-E representative should meet with the Contracting Officer's Representative (COR) to emphasize the A-E QC responsibilities. An opportune time is during the first visit of the A-E to the District Office, such as the prenegotiation conference. QC paragraphs shall be added to the SOW as follows:

a) The A-E is reminded of his contractual obligation as stated in the contract clauses (FAR 52.326-23) that he is responsible for the professional quality, technical accuracy, and the total coordination of all designs, drawings, specifications, and other services furnished by this Scope of Work. The A-E shall provide a copy of the proposed Quality Control Plan concurrently with the fee proposal, but under separate cover letter. The plan shall describe the proposed quality control process, method of documenting peer review efforts, and the time line for this QC process and related correction period prior to submittal of the design documents to the Government. See Chapter 1 of the A-E Guide for details.

b) The A-E shall submit one set of his final QC check prints and comments to the SPK with project submittal.

c) The period of work, within the period of service, is specified in the SOW and shall be "X" calendar days prior to submitting the documents to the Government, as determined by the PM.

2) I-H Design. In order for Civil Design Branch to effectively execute a design, effort must be determined, resources defined and allocated, budget and schedule established, and project specific assumptions documented. Additionally, responsibility and accountability must be delegated and assigned. Project QCP requirements are also addressed in the QMPs of other Branches involved in the design process. All these items collectively define and set performance targets and objectives, the critical first step in execution of a design and must be resourced through design funds.

6.1.9.2 Quality Assurance Plan (QAP).

A QAP shall be prepared for every engineering product or service completed by A-E contract. The PM shall have a system in place to ensure himself/herself that the QAP is being implemented and followed through each phase of the design process. These activities may include phone calls to the designer to verify scheduled QC functions, design deliverables, and for visits to the designer's office, and will include requesting copies of the designers QC activity comments/responses. The QAP shall address the above activities and verify that the A-E QCP has been carried out.

6.2 Design Verification

6.2.1 Peer Review/Checking.

All projects shall be appropriately checked. Independent spot-checking and review of each designer's assumptions, analyses, and calculations shall be performed throughout the design process. This effort shall be conducted by journeyman or senior personnel within the same technical discipline section who are not directly involved with the development of the project design being reviewed.

6.2.2 Senior Staff Overview.

Technical discipline or selected senior personnel shall perform an experience-based suitability review of major/critical technical decisions, directions, and system selections embodied in their portion of the project design. This review shall be performed prior to the individual design team members releasing their portion of the design effort to the design team members. The technical discipline shall be responsible for insuring that their staffs are trained, competent, and suitably overviewed to provide a high level of technical competence for their disciplines' contribution to each design team.

6.2.3 Seamless Review.

Design Team members will consult with their Independent Technical Review counterparts at appropriate points throughout the effort to discuss major assumptions and functional decisions, analytical approaches, and significant calculations to preclude significant comments from occurring that could adversely impact project schedules and costs. The conclusions/agreements reached should be documented and copies retained by each participant.

6.2.4 Interdisciplinary Team Coordination.

A detailed interdisciplinary coordination review shall be conducted by the full design team after the Senior Staff Overviews. During this review, individual designers shall check for discrepancies, within their work and between their work and the work prepared by other design team members. The goal is to eliminate flaws and conflicts within the plans, the specifications, and between the plans and specifications. The design team will be responsible for developing a well integrated and technically sound design that meets the customer's requirements according to governing criteria and regulations.

6.2.5 Independent Technical Review (ITR).

The review process, the level of reviews and agencies responsibilities will be addressed as early as the General Design Conference. In coordination with the I-H review team (differing in membership from design team members), the PM shall establish the review level for each project. This in turn will be reflected in the NAS schedule and the established project design budget. All independent technical reviews shall be accomplished using the Automated Review Management System (ARMS).

1) Standard Projects. All standard project designs are subject to an independent technical review by the PM, I-H review team, other appropriate District technical personnel, the customer, and others.

2) Complex or Unique Projects. Independent technical review procedures shall be developed for complex or unique projects on a case by case basis. These special procedures shall be in addition to the basic procedures defined in this QMP. These procedures shall be defined, agreed to and budgeted for among the PM, I-H review team, other appropriate District technical personnel, and the customer, when necessary, prior to initiating the review.

6.2.6 Biddability, Constructibility, Operability and Environmental (BCOE) Review.

BCOE reviews are required in accordance with ER 415-1-11 for all design products, A-E or I-H. BCOE and functional reviews of project design documents shall be conducted in ARMS by Construction-Operations Division personnel and the project customer(s), respectively, following completion of each major stage of design. Designer choice and editorial type comments shall be discouraged. The PM shall arbitrate any unresolved comments between the author(s) and design team. As required by ER 415-1-11, Engineering and Construction-Operations Divisions shall provide formal, written certification that all appropriate BCOE comments have been incorporated in the design documents. The BCOE certificate will be included as a portion of ITR certification identified in paragraph 6.2.7.

6.2.7 Certification.

Chief Engineering Division and the District Commander shall certify that the quality control process for each design has been completed and that all identified ITR technical issues have been resolved. The PM shall resolve all ITR technical comments and file the signed QC certificate (see CESPD R 1110-8, Appendix H, for a sample).

6.2.8 Value Engineering (VE) Studies.

VE studies are required for all Civil Works projects with an estimated construction value of $10,000,000 or greater and shall be considered for those greater than $2,000,000. The SPK VE office shall schedule and conduct studies for appropriate projects in the most cost effective manner, either by A-E contract or by the VE office. VE is an effective tool to reduce project construction costs and can add to the quality of a design if applied early enough in the design cycle. When applicable, the VE Officer shall coordinate with the project PM the conduct of a VE study early in the design process to maximize quality enhancement and cost reduction ideas. The PM shall coordinate closely with the design team regarding the timing and results of VE studies.

6.2.9 South Pacific Division (SPD) Involvement.

SPD is responsible for Civil Works Design QA program management throughout the Division. To execute this mission effectively, SPK technical personnel must maintain an open partnership relationship with SPD. To foster this partnership and enhance Civil Works Design Quality Management initiatives, SPD QA team personnel will provide services in support of SPK I-H design programs as defined in CESPD R 1110-1-8, Quality Management Plan.

7.0 RECORDS

Records for the following will be kept in the project files maintained by the PM. Examples of records are the QCP, all comments and their resolutions in ARMS, minutes of review meetings, and the QCP/BCOE certification.

a. Design directives

b. General Design conference minutes

c. Scope of Work/Scope of Services

d. Total Project Budget

e. Project Schedule

f. Notice to Proceed

g. A-E/I-H QCP document

h. Evaluation of the QCP

i. A-E QAP document

j. I-H Distribution Memorandum

k. List of key review milestones

l. QC certificate/BCOE certificate